

TABLE 3.—Total, I_m , and screened, I_v , I_r , solar radiation intensity measurements, obtained during July 1934, and determinations of the atmospheric turbidity factor, β , and water-vapor content, w =depth in millimeters, if precipitated.—Continued

Atmospheric conditions during solar radiation measurements—Blue Hill Meteorological Observatory of Harvard University

Date and time from apparent noon	Air temperature	Wind (Beaufort scale)	Visibility, Scale, 0-10	Sky blue-ness	Cloudiness and remarks
July 1934	°C.				
2; 4:11 a.	23.3	WNW 4	8	7	2 Ci.
2; 3:37 a.	25.6	WNW 3	8	6	1 Ci.
2; 2:16 a.	25.6	WNW 4	8	7	1 Ci.
2; 0:19 a.	26.7	WNW 4	8	8	Few Ci; 1 Cu.
2; 1:37 p.	27.8	WNW 4	9	6	1 Ci, 2 Cu. Wind gusty.
2; 4:04 p.	28.3	W 4	8+	8	3 Cu; Wind gusty.
4; 3:12 a.	21.7	NW 2	9	6	1 Ci, 1 Cu.
5; 1:45 p.	26.1	WSW 4	9	6	Few Ci, 2 Acu.
5; 3:28 p.	22.2	SWxW 5	9	6	2 Ci, 3 Acu. few Cu.
7; 1:17 a.	29.4	SW 3	6-7		Few Ci, Cu, Stcu, Freu; moderate haze.
8; 5:24 p.	22.2	SExSE 2	9	7	3 Acu, few Cu.
9; 3:10 a.	18.6	NNE 6	8	5	1 Acu.
9; 1:10 a.	19.7	NE 4	9	6	1 Acu; lt. hz.; smoke to the N-SW.
9; 1:27 p.	20.3	ENE 2	9	7	1 Acu, few Freu; smoke over Boston.
9; 4:22 p.	21.9	E 1	9	7	2 Ci, few Cu.
10; 2:17 a.	18.3	ENE 2	8	5	Few Acu, Cu.
10; 0:27 a.	18.3	ENE 2	8	5	1 Stcu.
10; 3:07 p.	20.0	NE 3	9	5	1 Cu. Smoke NW of Boston.
11; 4:00 a.	18.3	SSE 1	8	5	2 Ci in NW; smoke on horizon.
11; 3:21 a.	20.0	SExS 1	7-8	5	2 Ci in NW; smoke on horizon.
11; 0:06 a.	27.2	SE 1	8	4	10 Ci, very thin sheet.
13; 2:36 a.	20.6	SSW 2	7-8		2 Ci, few Cu, moderate haze.
13; 0:39 a.	25.0	SSW 2	8		4 Stcu.
24; 3:15 a.	21.7	ENE 1	8	5	2 Ci, few Cu.
24; 2:03 a.	21.7	N 1			4 Ci, few Cu.
30; 4:30 p.	22.4	ENE 3	8		1 Acu in south; few Ci in south-east.

POSITIONS AND AREAS OF SUN-SPOTS

Communicated by Capt. J. F. Hellweg, U.S. Navy, Superintendent U.S. Naval Observatory. Data furnished by the U.S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups

Date	Eastern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1934	<i>h. m.</i>	°	°	°				
July 1	12 0	No spots						Mount Wilson.
July 2	11 14	No spots						U.S. Naval.
July 3	11 18	No spots						U.S. Naval.
July 4	12 20	No spots						U.S. Naval.
July 5	11 4	No spots						U.S. Naval.
July 6	14 30	-80.5	271.8	+21.5	448		448	Harvard.
July 7	11 15	-68.0	272.8	+24.0	153		153	Mount Wilson.
July 8	13 4	-55.5	271.2	+24.0		93	93	U.S. Naval.
July 9	11 9	-42.5	272.0	+24.0		131	131	U.S. Naval.
July 10	14 28	-28.0	271.4	+24.0		131	131	U.S. Naval.
July 11	11 15	-79.0	209.0	+2.0	46			U.S. Naval.
		-15.5	272.5	+24.0	123		169	
July 12	14 55	-63.0	209.7	+1.5	46			U.S. Naval.
		-1.0	271.7	+24.0	108		154	

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. Little, in charge]

By L. T. SAMUELS

It will be noted that table 1 contains marked differences both in the names and number of stations from those given heretofore. This is owing to the expanded aerological program which became effective July 1, 1934, according to which daily flights are made at a number of Army and Navy stations in addition to those at Weather Bureau stations. The latter have been relocated in all cases, except Omaha, in order to obtain a better distribution over the country as a whole. Also, the times of observations, and maximum heights attained, at the military stations have been standardized to conform to those of the Weather Bureau in practically all cases. Because of the large number of new stations, it is impossible at

TABLE 3.—Total, I_m , and screened, I_v , I_r , solar radiation intensity measurements, obtained during July 1934, and determinations of the atmospheric turbidity factor, β , and water-vapor content, w =depth in millimeters, if precipitated.—Continued

POSITIONS AND AREAS OF SUN-SPOTS—Continued

Date	Eastern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1934	<i>h. m.</i>	°	°	°				
July 13	13 25	-50.0	210.3	+1.0	69			U.S. Naval.
		+11.0	271.3	+24.0	108		177	
July 14	11 5	-37.5	210.8	+1.0	69			U.S. Naval.
		+23.0	271.3	+24.0	108		177	
July 15	18 0	-20.0	211.3	+1.0	122			Mount Wilson.
		+41.0	272.3	+25.0	137		259	
July 16	11 8	-11.0	210.9	+1.0	62			U.S. Naval.
		+49.5	271.4	+25.0	108		170	
July 17	13 20	+3.0	210.4	+1.5	54			U.S. Naval.
		+63.0	270.4	+25.0	62		116	
July 18	11 13	+17.0	212.4	+1.5	46			U.S. Naval.
		+76.0	271.4	+25.0	66		92	
July 19	11 16	+30.0	212.1	+1.5	39		39	U.S. Naval.
July 20	13 26	+44.0	211.7	+1.5	8		8	U.S. Naval.
July 21		No spots						Harvard.
July 22	13 48	No spots						U.S. Naval.
July 23	11 17	No spots						U.S. Naval.
July 24	13 21	No spots						U.S. Naval.
July 25	11 38	No spots						U.S. Naval.
July 26	13 16	No spots						U.S. Naval.
July 27	9 0	No spots						Mount Wilson.
July 28	11 10	-10.0	53.0	+11.0		5		Mount Wilson.
		+10.0	73.0	-25.0		5	10	
July 29	11 15	+23.0	72.8	-25.0		7	7	Mount Wilson.
July 30	11 32	No spots						U.S. Naval.
July 31	11 29	No spots						U.S. Naval.
Mean daily area for 31 days							75	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JULY 1934

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

July 1934	Relative numbers	July 1934	Relative numbers	July 1934	Relative numbers
1	0	11	d 24	21	7
2	0	12	b 24	22	0
3	0	13	25	23	0
4	0	14	24	24	7
5	0	15	17?	25	8
6	d 8	16	23	26	0
7	8	17	17	27	7?
8	11	18	17	28	7
9	11	19	17	29	0
10	18	20	8	30	0
				31	0

Mean: 31 days=9.3.

b= Passage of a large group or spot through the central meridian.

d= Entrance of a large or average-sized center of activity on the east limb.

present to determine departures from the normals, except in a few cases.

The free-air temperatures for July averaged highest over San Diego and lowest over Spokane. It is interesting to note the free-air temperatures at Billings and Cheyenne as compared with those far to the south. The action of insolation over this Plateau to cause higher temperatures of the air for considerable elevations above the surface, in contrast to those of the free air over adjacent low-lying regions for corresponding elevations above sea level, is thus brought out. Moreover, Cheyenne showed the most pronounced average temperature inversion directly off the surface of all the stations.

Free-air relative humidities averaged highest over the southeastern section of the country and lowest over the middle Pacific coast.

Free-air resultant winds for the month deviated most from normal over the southern part of the country, where

velocities were light and directions variable. Resultant velocities at the higher levels generally exceeded the normals along the Pacific coast and at a few inland stations. Resultant directions were close to normal at most stations.

TABLE 1.—Free-air temperatures and relative humidities obtained by airplanes during July 1934

Station	Altitude (meters) m.s.l.																	
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
TEMPERATURE (°C.)																		
Billings, Mont. ¹ (1,090 m)	18.0						20.5		18.7		15.7		12.2		4.3		-3.7	
Boston, Mass. ² (6 m)	15.8								18.0		20.0		16.2		6.8		-2.5	
Cheyenne, Wyo. ¹ (1,873 m)	15.6		18.4		19.1		17.1		14.8		12.2		9.2		2.4		-4.3	
Fargo, N.Dak. ¹ (274 m)																		
Fort Crockett (Galveston), Tex. ³ (3 m)	26.3		25.2		23.0		20.5		17.3		14.3		10.9		4.5		-1.6	
Kelly Field (San Antonio), Tex. ³ (211 m)	23.9		23.6		22.3		20.5		17.6		14.3		11.1		4.8		-1.3	
Lakehurst, N.J. ⁵ (3 m)																		
Maxwell Field (Montgomery), Ala. ³ (52 m)	24.1		25.1		22.4		19.1		16.2		13.0		9.8		3.4		-2.5	
* Mitchel Field (Hempstead, L.I.), N.Y. ³ (39 m)	21.1		22.7		19.9		16.8		13.9		10.5		7.5		1.5		-4.7	
Murfreesboro, Tenn. ¹ (174 m)	22.7		21.0		19.8		17.3		14.4		11.4		8.2		2.0		-4.1	
Norfolk, Va. ⁵ (3 m)	24.1	-0.9	23.6	-0.3	21.5	-0.3	18.8	-0.3	15.7	-0.1	12.7	-0.3	9.6	-0.6	3.7	-0.6	-2.3	-0.6
Oklahoma City, Okla. ¹ (391 m)	24.3		25.9		26.9		23.7		20.1		16.5		12.7		5.5		-1.1	
Omaha, Nebr. ¹ (300 m)	23.1		24.7		26.9	+5.6	21.3	+5.9	20.9	+5.5	16.9	+4.7	12.8	+3.9	4.9	+2.6	-2.3	+1.3
Pearl Harbor, Hawaii ⁵ (5 m)	23.4	-2.7	21.7	-1.1	18.2	-0.9			12.9	-1.1			9.0	-1.9	3.8	-2.5	-1.4	-2.4
Pensacola, Fla. ⁵ (2 m)																		
Philadelphia, Pa. ⁵ (3 m)																		
San Diego, Calif. ⁵ (5 m)	18.9	-2.2	17.8	-0.7	20.9	-1.3			21.8	+0.4			15.5	-1.9	8.2	-1.8	1.6	-1.8
Scott Field (Belleville), Ill. ³ (135 m)	22.6		26.6		25.6		22.0		18.2		14.8		10.9		2.6		-3.9	
Seattle, Wash. ⁵ (8 m)																		
Selfridge Field (Mt. Clemens), Mich. ³ (177 m)	19.3		22.1		20.9		18.3		15.7		12.9		10.1		4.2		-2.0	
Spokane, Wash. ⁷ (596 m)	14.9				18.5		16.2		12.3		8.3		4.8		-2.0		-8.6	
Sunnyvale, Calif. ³ (6 m)	16.5		14.4		17.3				18.4				12.0		3.9			
Washington, D.C. ⁵ (2 m)	21.6	-2.7	21.7	-0.6	21.1	+0.7			17.1	+2.2			11.2	+2.1	4.4	+1.2	-2.5	+1.1
Wright Field (Dayton), Ohio ³ (244 m)	21.2		23.0		23.5		20.6		17.5		14.2		10.9		4.3		-2.0	
RELATIVE HUMIDITY (PERCENT)																		
Billings, Mont. ¹ (1,090 m)	53						47		45		46		47		51		52	
Boston, Mass. ² (6 m)																		
Cheyenne, Wyo. ¹ (1,873 m)	55								51		40		38		43		51	
Fargo, N.Dak. ¹ (274 m)	81		64		50		46		42		40		40		42		46	
Fort Crockett (Galveston), Tex. ³ (3 m)	86		80		64		55		54		52		53		52		52	
Kelly Field (San Antonio), Tex. ³ (211 m)	89		87		71		60		57		54		52		47		45	
Lakehurst, N.J. ⁵ (3 m)																		
Maxwell Field (Montgomery), Ala. ³ (52 m)	92		72		73		73		68		66		66		64		59	
* Mitchel Field (Hempstead, L.I.), N.Y. ³ (39 m)	86		66		65		62		57		53		54		54		51	
Murfreesboro, Tenn. ¹ (174 m)	92		75		69		66		66		61		59		63		52	
Norfolk, Va. ⁵ (3 m)	88	+10	79	+9	73	+9	72	+8	70	+9	69	+10	66	+12	61	+12	54	+12
Oklahoma City, Okla. ¹ (391 m)	66		58		45		44		46		49		53		54		53	
Omaha, Nebr. ¹ (300 m)	65	0	59	-4	46	-13	44	-14	43	-13	44	-11	47	-7	53	+1	53	+1
Pearl Harbor, Hawaii ⁵ (5 m)	82	+14	79	+4	82	0			67	-4			41	-1	29	+1	22	+1
Pensacola, Fla. ⁵ (2 m)																		
Philadelphia, Pa. ⁵ (3 m)																		
San Diego, Calif. ⁵ (5 m)	85	+9	83	+3	58	+8			35	+4			42	+3	46	0	45	0
Scott Field (Belleville), Ill. ³ (135 m)	79		61		57		61		62		57		58		60		55	
Seattle, Wash. ⁵ (8 m)																		
Selfridge Field (Mt. Clemens), Mich. ³ (177 m)	76		57		54		54		53		49		44		40		38	
Spokane, Wash. ⁷ (596 m)	57				43		41		44		47		46		45		49	
Sunnyvale, Calif. ³ (6 m)	76		79		59				27				23		19			
Washington, D.C. ⁵ (2 m)	84	+11	78	+10	67	+4			71	+7			62	+4	57	+6	54	+6
Wright Field (Dayton), Ohio ³ (244 m)	83		66		51		53		50		49		49		48		42	

¹ Weather Bureau.

² Massachusetts Institute of Technology.

³ Army.

⁴ June to November, inclusive, only.

⁵ Navy.

⁶ Lakehurst and Philadelphia alternate daily.

⁷ National Guard.

* For Aug. 18-31, inclusive.

Observations taken at 5:00 a.m., 75th meridian time, except along the Pacific coast and Hawaii, where they are taken at 5:00 a.m., local standard time.

TABLE 2.—Free-air resultant winds (meters per second) based on pilot-balloon observations made near 7 a.m. (E.S.T.) during July 1934

[Wind from N=360°, E=90°, etc.]

Altitude (m) m.s.l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Bismarck, N. Dak. (518 m)		Brownsville, Tex. (7 m)		Burlington, Vt. (132 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cleveland, Ohio (245 m)		Dallas, Tex. (154 m)		Havre, Mont. (762 m)		Jacksonville, Fla. (14 m)		Key West, Fla. (11 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface	360	1.3	291	1.3	49	1.4	151	1.7	184	2.0	281	3.5	264	0.2	188	1.6	173	2.7	254	0.8	240	1.2	131	2.0
500			298	2.9			170	2.1	332	2.0			331	1.5	230	2.8	209	2.5	272	3.2	272	3.2	130	2.5
1,000			298	4.4	144	3.9	171	2.2	327	4.1			240	4.0	275	4.0	204	2.5	257	1.5	256	2.5	132	2.3
1,500			303	5.5	230	1.9	176	2.3	289	6.8			203	5.1	276	5.6	190	2.2	292	2.2	250	1.1	146	2.5
2,000	129	1.7	301	5.2	272	3.6	163	6.3	291	9.6	298	5.0	275	7.1	288	7.0	156	2.7	289	4.1	223	0.8	129	2.7
2,500	182	1.9	305	5.5	287	5.1	164	4.7	294	9.5	253	4.3	280	7.7	291	8.1	128	2.7	269	5.5	223	0.8	131	2.4
3,000	227	2.2	309	5.5	288	6.5	144	3.0	290	10.5	256	4.3	289	8.3	284	8.1	110	2.5	251	7.3	228	0.7	108	2.0
4,000	292	1.5	157	0.5	285	9.5	122	3.2	291	7.7	276	2.6	290	9.0	289	8.2	116	2.8	249	11.9	228	0.5	106	1.7
5,000	37	1.2	34	1.5	298	10.5	104	2.9	294	8.6	275	7.0	295	9.7	290	12.6	114	2.8	251	14.6	305	0.4	360	1.0

	Los Angeles, Calif. (217 m)		Medford, Oreg. (410 m)		Memphis, Tenn. (83 m)		New Orleans, La. (19 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Phoenix, Ariz. (338 m)		Salt Lake City, Utah (1,294 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Washington, D.C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface	68	0.1	302	0.8	186	1.3	287	1.0	239	1.2	172	3.4	88	1.0	69	1.3	151	4.1	359	0.4	124	1.0	195	0.1
500	113	1.7	280	1.4	243	6.5	337	3.3	262	2.9	189	6.8	164	2.6	263	0.2			302	0.4	171	0.5	256	1.6
1,000	16	0.6	287	1.9	257	3.1	216	3.3	300	4.9	219	12.3	214	7.7	261	2.3			298	3.6	85	0.6	307	2.3
1,500	263	2.2	234	0.4	276	1.9	212	3.5	259	3.1	215	2.0	238	9.1	267	1.5	161	5.2	286	5.6	286	1.4	296	4.3
2,000	246	2.2	189	1.7	307	0.6	204	3.5	242	3.2	226	3.9	247	9.6	239	1.0	175	4.9	294	7.4	282	3.1	293	6.0
2,500	207	3.2	214	5.3	89	0.7	218	3.5	212	4.5	215	2.0	253	7.4	177	1.1	198	3.6	298	9.1	295	3.1	294	6.7
3,000	184	2.5	212	7.9	91	1.5	200	2.3			187	1.4	262	6.7	157	2.0	234	3.5	298	9.3	276	3.6	290	8.1
4,000	168	4.4	226	9.1	70	2.6	259	3.1			163	1.5	279	7.5	146	3.3	254	5.3	304	12.7	249	4.8	292	8.0
5,000	161	4.8	219	11.1			177	0.9			59	2.3	311	13.6	128	4.6	232	7.5	305	11.2	260	4.0	293	7.6

RIVERS AND FLOODS

By RICHMOND T. ZOCH

(River and Flood Division, MONTROSE W. HAYES, in charge)

A few minor floods occurred in Pennsylvania, South Carolina, and Mississippi; practically no damage was caused by these floods. A moderate flood occurred in the Nolichucky River in Tennessee; more than \$175,000 of damage was done there.

Most of the rivers of the United States were low. The lowest stages of record for the month of July were recorded in the Missouri River at Sioux City, Kansas City, and Hermann; in the Ohio River at Cairo, and in the Mississippi River at Keokuk, Hannibal, Grafton, St. Louis, Chester, Memphis, Helena, and Vicksburg. At Little Rock, Ark., the lowest stage of record for all months was recorded. These low stages do not necessarily mean comparatively low discharges, as the following remarks of the official in charge at Little Rock show:

This office has not received any statement of the number of second-feet passing, but think it is about the same as in previous years when the river was at extreme low water, about 800 or 1,000 second-feet. The channel has been cutting a shorter course about 2 miles below the gage and it is probable that the resulting increased rate of flow would cut the channel deeper, letting the pool opposite Little Rock down.

Heavy rains over the Bear Creek watershed near Denver, Colo., resulted in floods which caused the loss of six lives and over \$50,000 of property.

Table of flood stages for July 1934

[All dates are in July]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Lackawaxen: Hawley, Pa.	<i>Feet</i> 6	28	28	<i>Feet</i> 11.0	28
Santee: Rimini, S.C.	12	12	14	13.5	13
Savannah: Ellenton, S.C.	14	19	21	13.4	21
		27	27	12.0	27
		14	14	14.9	14
EAST GULF OF MEXICO DRAINAGE					
Pearl:					
Edinburgh, Miss.	20	9	12	21.6	10
Jackson, Miss.	18	16	20	19.6	18
MISSISSIPPI SYSTEM					
<i>Ohio Basin</i>					
Nolichucky: Embreeville, Tenn.	10	15	15	12.6	15